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www.epa.gov/innovation/lean.htm

Lean Manufacturing & the Environment:
Opportunities for Environmental Improvement

EPA sees an important connection between lean manufacturing and environmental improvement. This fact sheet summarizes this relationship as well as steps that EPA is taking to enhance the environmental benefits of advanced manufacturing techniques and trends.

What Is Lean?

Lean manufacturing is a business model that emphasizes eliminating waste while delivering quality products at the least cost to the manufacturer and customers. In the U.S., lean implementation began in the 1980's in the automotive and aerospace sectors. Today, lean initiatives are spreading rapidly in numerous manufacturing and service sectors.

Lean thinking focuses on three objectives:

- Reduce production resource requirements by minimizing inventory, equipment, storage and production space, and materials;
- Increase manufacturing velocity and flexibility; and
- Improve quality and eliminate defects.

Lean methods create a *continual improvement-based, waste elimination culture* that involves workers at all levels of the organization. There are a variety of common lean methods, including *Kaizen* (Japanese for improvement) rapid improvement events, just-in-time manufacturing, total productive maintenance, cellular production (or synchronous, single-piece flow manufacturing), and Six Sigma.

Lean and the Environment

An October 2003 U.S Environmental Protection Agency (EPA) report (see http://www.epa.gov/innovation/lean.htm) examines the relationship between lean and the environment and points out opportunities for further enhancing organizations' environmental performance through their lean initiatives.

Some key findings:

- ***Lean produces an operational and cultural environment that is highly conducive to waste minimization and pollution prevention.*** Significant environmental benefits typically ride the coattails of lean initiatives. The powerful economic and competitiveness drivers behind lean drive a willingness to undertake substantial operational and cultural changes, many of which have important environmental performance implications. Lean typically results in less material use and scrap, reduced water and energy use, and decreased number and amount of chemicals used.
- ***Lean can be leveraged to produce even more environmental improvement.*** Although lean currently produces environmental benefits and establishes a systemic, continual improvement-based waste elimination culture, lean methods do not explicitly incorporate environmental performance considerations, forgoing some environmental improvement opportunities. Lean provides an excellent platform for broadening companies' definition of waste to address environmental risk and product life-cycle considerations as some lean practitioners have demonstrated.
- ***Some regulatory "friction" can be encountered when applying lean to environmentally-sensitive processes.*** The right-sized, flexible, and mobile operating approach used in lean manufacturing is quite different from traditional manufacturing

operations, and can be challenging to use in environmentally-sensitive manufacturing processes such as painting and coating. Some lean practitioners believe this results in situations where either environmental performance improvements can be constrained or the risk of non-compliance increases.

- ***Environmental agencies have a window of opportunity - while companies are embarking on lean initiatives and investments - to collaborate with lean promoters to further improve the environmental benefits associated with lean.*** There is a strong and growing network of organizations promoting lean. These organizations share a goal with organizations promoting environmental improvement and pollution prevention—both strive to eliminate waste from business. At present, however, there is virtually no coordination or collaboration between the environmental and lean networks.

EPA and Lean

Recognizing that lean trends have implications for both agency regulatory programs and voluntary environmental improvement initiatives, EPA formed the Lean & Environment Steering Committee in June 2003. The key objectives of the Committee, composed of representatives from EPA offices, regions and several States, are to:

- Raise awareness of the relationship between lean manufacturing and environmental performance and its potential to reduce the environmental footprint of manufacturing and service industry processes;
- Promote the growth of lean practices that routinely incorporate environmental considerations (such as pollution prevention, waste minimization, and design for environment) into the decision making of lean initiatives;
- Identify and address administrative and regulatory uncertainties and impediments to enhanced environmental performance; and
- Foster research and use of emerging and innovative technologies that reduce the environmental footprint of hazardous chemicals in products or processes.

The Committee does not intend to promote lean manufacturing or to launch separate initiatives to address lean manufacturing; rather, it will assist existing regulatory programs and voluntary initiatives in responding to opportunities and challenges posed by lean manufacturing trends. Additionally, the Committee is actively seeking to partner with Federal, State, local, and Tribal agencies and programs, non-governmental organizations, and industry representatives to promote the environmentally-beneficial aspects of lean initiatives.

For more information, or to discuss partnership opportunities, please contact:

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Since the 1990's academics and lean experts have documented significant environmental benefits resulting from lean implementation efforts. For example:

Naugatuck Glass Company in Connecticut cut product lead time, enhanced equipment longevity, and improved quality. Additional environmental benefits included a 50% reduction in material scrap, a 40% percent decrease in water use, and a 19% reduction in energy use.

(National Institute of Standards and Technology's Manufacturing Extension Partnership. Clean Manufacturing Executive Overview, Washington DC, 2002.)

Bridgestone/Firestone in Aiken, South Carolina, a passenger and light truck tires plant, has implemented lean processes since 2000. They have seen a reduction in hazardous and solid waste generation of 53% and a decrease in material scrap of 38%.

(See Shingo Prize 2002 Business Prize Recipients at http://www.shingoprize.org)

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